BINDURA UNIVERSITY OF SCIENCE EDUCATION

FACULTY OF SCIENCE EDUCATION

BACHELOR OF SCIENCE EDUCATION HONOURS DEGREE IN MATHEMATICS

Beyond Access: Exploring Mathematics Teachers' Pedagogical Beliefs and The Underutilization of ICT Tools in Zimbabwean Secondary Schools

BY

NHANDO KILLION SEKAYI

(Registration No: B240139A)

SUPERVISOR: DR ISAAC GWIZANGWE

A Dissertation Submitted to Bindura University of Science Education in Partial Fulfilment of the Requirements for the Bachelor of Science Education Honours Degree in Mathematics

YEAR 2025

APPROVAL FORM

The undersigned certify that they have read and recommended to Bindura University of Science Education for the acceptance of a project titled, *Beyond Access: Exploring Mathematics Teachers' Pedagogical Beliefs and The Underutilization of ICT Tools in Zimbabwean Secondary Schools*, by Nhando Killion Sekayi (Reg. No: B240139A) in partial fulfilment of requirements of Bachelor of Science Education Honours Degree in Mathematics.



……..

STUDENT DATE

……..

SUPERVISOR DATE

……

CHAIRMAN DATE

RELEASE FORM

NAME OF AUTHOR: **NHANDO KILLION SEKAYI**

TITLE OF PROJECT:

Beyond Access: Exploring Mathematics Teachers' Pedagogical Beliefs and The Underutilization of ICT Tools in Zimbabwean Secondary Schools

DEGREE FOR WHICH DISSERTATION WAS PRESENTED:

BACHELOR OF SCIENCE EDUCATION HONOURS IN MATHEMATICS

YEAR THIS DEGREE WAS COMPLETED: **2025**

Permission is hereby granted to Bindura University of Science Education Library to reproduce single copies of this project and lend or sell such copies only for private, scholarly or scientific research purposes. The author reserves publication rights and neither the project nor extensive extracts from it may be printed or reproduced without the author's written permission.

SIGNED:  **DATE: _____**

PERMANENT ADDRESS: 9855 New Stands, Warren Park D, Harare

DEDICATION

This research project is dedicated to:

My late father, Enock Chamirayi and my late mother, Jestina, who instilled in me the value of education and encouraged me to pursue my dreams. Their unwavering support, love, and sacrifices have been the foundation of my academic journey.

My brothers and sisters, who have been a constant source of support and encouragement throughout my studies.

My friends and colleagues at work, who have offered valuable advice, guidance, and motivation.

My fellow Mathematics students, who have shared their knowledge, experiences, and camaraderie with me.

My lecturer and supervisor, DR Isaac Gwizangwe who has guided and mentored me. His expertise, patience, and dedication to my research have been invaluable.

And most especially, to my beloved daughters, Ellen and Elsie, who are my inspiration and motivation to strive for excellence in all that I do.

May this work be a testament to the power of education and the impact it can have on individuals, families, and communities.

ACKNOWLEDGEMENTS

I would like to express my sincere gratitude to the following individuals and institutions who have contributed to the completion of this research project:

- My supervisor, DR Isaac Gwizangwe, for his guidance, expertise, and unwavering support throughout this research journey.

- The Bindura University of Science Education, for providing me with the opportunity to pursue my studies and conduct this research.

- The mathematics teachers, school managers and learners, who, as participants of this study generously gave their time and shared their valuable insights.

- My family, friends and colleagues, who have offered encouragement, support, and motivation throughout this journey.

I am grateful for the support and contributions of all those who have helped me complete this research project. May the Lord God bless you abundantly.

ABSTRACT

This study explores the influence of mathematics teachers' pedagogical beliefs on the underutilization of ICT tools in Zimbabwean secondary schools. Although ICT infrastructure is increasingly available, its integration into instructional practice remains limited. Using a qualitative multiple-case study approach, data were collected through questionnaires, interviews, observations, and document analysis in five secondary schools.

Findings revealed that teacher-centered beliefs, exam-oriented pressures, limited subject-specific ICT training, and weak policy implementation significantly hinder effective ICT integration.

The study concludes that beliefs, not just access, must be addressed through targeted professional development and institutional support. Recommendations are made for policymakers, teacher training institutions, and school administrators to bridge the gap between ICT availability and pedagogical practice.

Table of Contents

APPROVAL FORM i
RELEASE FORM ii
DEDICATION iii
ACKNOWLEDGEMENTS iv
ABSTRACT v
CHAPTER 1 INTRODUCTION 1
1.1 Introduction 1
1.2. Background to the Study 1
1.3 Statement of the Problem 2
1.4 Purpose of the Study 2
1.5 Research Objectives 3
1.6 Research Questions 3
1.7 Assumptions and Hypotheses 4
1.7.1 Assumptions: 4
1.7.2 Hypotheses: 4
1.8 Significance of the Study 4
1.9 Scope and Delimitation of the Study 5
1.10 Limitations of the Study 5
1.11 Definition of key terms 6
1.12 Summary 6
CHAPTER 2 LITERATURE REVIEW 7
2.1 Introduction 7
2.2 Theoretical Framework 7
2.2.1 Technological Pedagogical Content Knowledge (TPACK) 7
2.2.2 Ertmer's First- and Second-Order Barriers 7
2.3 ICT Integration in Mathematics Education 7
2.4 Teachers' Pedagogical Beliefs and ICT Usage 8
2.4.1 Influence of Beliefs on Instructional Practices 8
2.4.2 Beliefs in the Zimbabwean Context 8
2.5 Barriers to ICT Integration in Zimbabwean Schools 8

2.6 Empirical Studies in Zimbabwe and Africa....9
2.7 Gaps in the Literature....9
2.8 Conceptual Framework....9
2.9 Summary....10
CHAPTER 3 RESEARCH METHODOLOGY....11
3.1 Introduction....11
3.2 Research Paradigm....11
3.3 Research Design....12
3.4 Population, Sampling and Sampling Techniques....12
3.5 Research Instruments....14
3.6 Questionnaire Design....14
3.7 Data Collection Procedures....15
The researcher made use of one research assistant to assist in administering both the questionnaire and survey. These were designed to capture all the necessary unavailable information on exploring the effect of pedagogical beliefs on ICT integration in mathematics teaching and learning. The researcher requested permission from the school headmasters where appropriate and was granted permission to enter schools for research purposes. This made all the work much easier....15
3.8 Ethical Considerations....15
3.9 Reliability and Validity....16
3.10 Limitations of the Methodology....16
3.11 Data Analysis Plan and Triangulation....17
3.11.1. Data Analysis and Presentation....17
3.11.2 Tables and figures:....17
3.11.3 Bar graphs and pie charts:....17
3.11.4. Qualitative Data Analysis....18
3.11.5 Data Triangulation....18
3.12 Summary....18
CHAPTER 4 DATA PRESENTATION AND ANALYSIS....19
4.1 Introduction....19
4.2 Overview of Participants....19
4.3 Mathematics Teachers' Demographic Information....19
4.3.1 Gender Distribution....19
Figure 4.1 Gender distribution....19
4.3.2 Age Distribution....20

Table 4.1 AGE INFORMATION..... 20
Figure 4.2 Age distribution of participants..... 20
4.4 Availability of ICT Tools: Triangulated Evidence..... 21
4.4.1 Quantitative Findings (Questionnaires)..... 21
Table 4.2 Accessible/available ICT in schools (out of 10)..... 21
Figure 4.3 Availability of ICT tools..... 21
4.4.2 Interview Confirmation..... 22
4.4.3 Document Analysis..... 22
4.5 ICT Usage by Teachers..... 22
4.5.1 Questionnaire Results..... 22
Table 4.3 ICT usage by mathematics teachers..... 22
Figure 4.4. Usage of ICT tools..... 23
4.5.2 Interview Insights..... 23
4.5.2.1. Frequency of use of ICT tools..... 23
Table 4.4. Frequency of use of ICT tools..... 23
4.6.Pedagogical Beliefs..... 24
4.6.1.Summary of data from mathematics teachers..... 24
Table 4.5 Pedagogical beliefs..... 24
Figure 4.5. Pedagogical beliefs of Mathematics teachers..... 24
4.6.2.Summary of data from school managers..... 25
Table 4.6 Pedagogical beliefs:views of school managers..... 25
Figure 4.6 Pedagogical beliefs: views of school managers..... 25
4.6.3. Quantitative Summary..... 25
4.7. Teachers' interview guide interpretation..... 26
4.7.1. Theme 1: Pedagogical Beliefs about Mathematics Teaching..... 26
4.7.2 Theme 2: Perceptions of ICT in Mathematics Instruction..... 26
4.7.3 Theme 3: Barriers Reinforcing Beliefs..... 27
4.7.4 Theme 4: Institutional and Policy Dynamics..... 27
4.8. Interpretation with Literature..... 27
4.9.Barriers to ICT Integration..... 28
4.9.1.Sumarised data collected from mathematics teachers..... 28
Table 4.7 Barriers reinforcing beliefs..... 28
Figure 4.7 Barriers reinforcing beliefs..... 28

4.9.2.Summarised data collected from School Managers..... 29
Table 4.8 Barriers reinforcing beliefs..... 29
Figure 4.8. Barriers reinforcing beliefs..... 29
4.10. Learners' Questionnaire: Triangulated Analysis..... 31
4.10.1 Learners' Views on Increased ICT Use (Question 9)..... 31
Table 4.9 learner's beliefs on ICT use..... 31
Figure 4.9 Learner's beliefs on ICT use..... 31
4.10.2 Common ICT Tools Used (Question 10)..... 32
Table 4.10 Common ICT tools used: view of learners..... 32
4.10.3 ICT Activities (Question 11)..... 32
Table 4.11 ICT activities used by teachers: view of learners..... 32
4.11 Triangulation of Findings..... 32
4.11.1 Key Convergences Across Data Sources..... 32
Table 4.12 Convergence of data..... 32
4.11.2. Triangulation Insight:..... 33
4.12 Emerging Patterns and Summary of Key Findings..... 33
4.13 Linking Findings to Research Questions..... 34
4.14 Summary..... 34
CHAPTER 5 DISCUSSIONS, CONCLUSIONS AND RECOMMENDATIONS..... 35
5.1 Introduction..... 35
5.2 Discussion of Major Findings..... 35
5.2.1 Prevailing Pedagogical Beliefs among Mathematics Teachers..... 35
5.2.2 Influence of Beliefs on ICT Integration..... 35
5.2.3 External and Internal Factors Shaping Beliefs..... 36
5.2.4 Policy-Practice Disconnection..... 36
5.3 Conclusions..... 36
5.4 Recommendations..... 37
5.5 Final Reflection..... 38
REFERENCES..... 39
APPENDICES..... 42
APPENDIX A Questionnaire for Teachers..... 42
APPENDIX B Semi-Structured Interview Guide..... 45
APPENDIX C Questionnaire for school managers..... 47

APPENDIX D Questionnaire for Learners..... 50

CHAPTER 1 INTRODUCTION

1.1 Introduction

The chapter presents the topic and background to the study. It outlines the research problem, purpose, objectives, and questions, as well as the significance and delimitations of the study. Key terms are defined, and assumptions and hypotheses are presented.

1.2. Background to the Study

In this digital era, the integration of Information and Communication Technologies (ICTs) into education has transformed how teaching and learning takes place globally. ICT tools give great potential to strengthen pedagogical practices in the classrooms. This is especially crucial in subjects like mathematics that benefit from visualizations, simulations, and dynamic modeling. Despite some notable investments in ICT infrastructure in schools across Sub-Saharan Africa, including Zimbabwe, the actual use of these technologies in classroom practice remains limited (Chigama & Goronga, 2022).

In Zimbabwean secondary schools, particularly in mathematics education, a notable gap exists between access to ICT tools and their meaningful utilization in pedagogical practice. While government policies and development agencies have prioritized ICT access, the focus has often overlooked the crucial role of teachers' pedagogical beliefs in shaping how, or whether technology is used in the classroom (Manhivi & Zikhali, 2020). Research suggests that teachers' perceptions, attitudes, and beliefs about technology influence the frequency and the effectiveness of ICT integration (Ertmer, 2005).

Previous studies have pointed to several challenges like insufficient training, lack of administrative support, and contextual barriers such as poor infrastructure and erratic electricity supply (Zindi & Ruparanganda, 2011; Mangena & Sibanda, 2024). However, less attention has been paid to internal, belief driven barriers. These determine teachers’ willingness to integrate ICT into their instructional routines in Zimbabwean schools.

This study aims to explore how mathematics teachers' pedagogical beliefs influence the underutilization of ICT tools in Zimbabwean secondary schools, thereby moving the discussion "beyond access" to deeper systemic and psychological factors that hinder ICT integration.

1.3 Statement of the Problem

Despite substantial progress in providing ICT infrastructure in Zimbabwean schools, the use of technology in actual teaching practice, especially in mathematic remains minimal. As highlighted by Zindi & Ruparanganda (2011), “technological tools gather dust not because of lack of electricity, but because of mental blocks within the teaching community"

Manhivi & Zikhali (2020) echoed this assertion by noting that rural schools often have access to ICT tools through donations, yet integration remains a dream deferred.

This is true for secondary schools where ICT tools were availed by government and through donations by the donor community. The general trend is that teachers still adhere to traditional pedagogies that marginalize technology.

Lack of infrastructure, training, and policy are commonly cited as barriers. However, the issue is not merely about access or availability. It is about the beliefs and attitudes of mathematics teachers, which determine whether and how ICT tools are used.

There is a critical gap in understanding how pedagogical beliefs influence ICT integration, particularly in the Zimbabwean secondary schools.

This study contends that even in environments where ICT access is present, underutilization persists because pedagogical beliefs have not evolved in tandem with technological availability. Without addressing these deeply rooted beliefs, efforts to improve ICT usage may continue to yield limited results.

1.4 Purpose of the Study

The purpose of this study is to explore the pedagogical beliefs of mathematics teachers in Zimbabwean secondary schools and how these beliefs contribute to the use or underutilization of ICT tools in their teaching practices.

Firstly, the study seeks to identify the nature of teachers’ pedagogical beliefs regarding the teaching of mathematics. Ertmer (2005) posited that “understanding teacher beliefs is the first step toward fostering authentic technology integration”. Why do teachers stick to traditional chalkboard and teacher-in-front methods even if technology is available to modernize teaching of mathematics? The teachers’ beliefs and attitudes are at the heart of this unwillingness to adopt technological tools in teaching. “Teachers’ pedagogical beliefs significantly influence their willingness and preparedness to adopt AI tools in instruction and assessment, not merely the availability of technology.” (Ofemm et al 2025)

Additionally, the study explores the perceptions of teachers about the role and value of ICT tools in mathematics instruction. As Chigama and Goronga (2022) noted, "teachers' perceptions serve as both a gateway and a barrier to ICT use in classrooms." Understanding these perceptions is very important for effective integration of ICT tools in teaching mathematics.

Furthermore, the study looks at the relationship between teachers' pedagogical orientations and their actual classroom use of ICT tools. (Mishra & Koehler, 2006,) were of the view that "technology adoption in education is less about devices and more about dispositions" This means that teachers beliefs shape their intentions, and their intentions shape their practices in the classroom.

Finally, the study zooms on the systemic and contextual factors that interact with teacher beliefs to influence ICT usage.

As Mangena & Sibanda (2024) observed, "without addressing the beliefs that shape classroom practices, ICT integration policies will remain largely symbolic" By focusing on belief systems rather than only on structural barriers, the study aims to offer nuanced insights that can inform teacher development programs, ICT policy implementation, and curriculum reforms in the Zimbabwean education system.

1.5 Research Objectives

1.5.1. To investigate the nature of mathematics teachers' pedagogical beliefs in Zimbabwean secondary schools.

1.5.2. To assess the extent to which these beliefs influence the integration of ICT tools in mathematics instruction.

1.5.3. To identify contextual and institutional factors that reinforce or challenge these beliefs.

1.5.4. To recommend strategies for aligning pedagogical beliefs with effective ICT use in mathematics education.

1.6 Research Questions

1.6.1. What are the prevailing pedagogical beliefs among mathematics teachers in Zimbabwean secondary schools?

1.6.2. How do pedagogical beliefs influence the integration, or lack thereof, of ICT tools in mathematics teaching?

1.6.3. What external (contextual) and internal (psychological or experiential) factors shape these beliefs?

1.6.4. How can teacher training and policy interventions address belief-related barriers to ICT integration?

1.7 Assumptions and Hypotheses

The following assumptions and hypotheses guide this investigation, providing a framework for understanding the dynamics of ICT integration in Zimbabwean secondary schools.

1.7.1 Assumptions:

1. Mathematics teachers in Zimbabwean secondary schools have varying pedagogical beliefs that influence their use of ICT tools.

2. The availability of ICT infrastructure in Zimbabwean secondary schools does not necessarily translate to effective integration in mathematics classrooms.

3. Teachers' perceptions and attitudes towards ICT significantly impact their willingness to integrate technology into their teaching practices.

4.The sample of teachers selected is representative of the wider population of secondary schools in Zimbabwe.

5.Data collected from the teachers will be free from major bias or deliberate misrepresentation

1.7.2 Hypotheses:

1. There is a significant relationship between mathematics teachers' pedagogical beliefs and their use of ICT tools in Zimbabwean secondary schools.

2. Teachers with constructivist pedagogical beliefs are more likely to integrate ICT tools in their mathematics teaching than those with traditional beliefs.

3. Professional development and training programs for teachers significantly enhance their confidence and competence in using ICT tools for mathematics instruction.

1.8 Significance of the Study

This study is significant for several reasons.

Firstly, it contributes to the growing body of literature on ICT integration in Sub-Saharan Africa by offering a focused analysis on the Zimbabwean mathematics education context.

Secondly, it shifts the discourse from extrinsic barriers also called external barriers (like infrastructure) to intrinsic or internal cognitive and cultural dimensions, namely pedagogical beliefs. “Too often, ICT policies fail because they overlook the human element, the teacher’s beliefs and classroom culture" (Chigama & Goronga, 2022).

Thirdly, the research focuses on mathematics which is often seen as too abstract. CT can play a transformative role in Mathematics education through visualization, simulations and modeling tools.

Finally, it contributes to policy discussions on ICT integration by highlighting the need to consider belief systems as part of professional development. It offers teacher educators practical

recommendations for aligning professional development programs with teachers' pedagogical beliefs. The study believes that understanding teacher perspectives and beliefs is key to reducing the resistance to educational reform. As observed by (Mangena & Sibanda,2024) "without addressing the beliefs that shape classroom practices, ICT integration policies will remain largely symbolic". This was also supported by (Zindi & Ruparanganda, 2011) when they said "the success of digital learning hinges more on human adaptability than on technical capability".

In conclusion, insights from the study may guide education policymakers, curriculum designers, school administrators, and teacher trainers in coming up with more holistic strategies for ICT integration. It also adds to the limited body of research on ICT use in mathematics teaching within the Zimbabwean context.

1.9 Scope and Delimitation of the Study

The study focuses specifically on secondary school mathematics teachers in selected secondary schools of Zimbabwe. It does not cover primary schools or other subject areas.

The research is delimited to the exploration of pedagogical beliefs and does not provide an exhaustive analysis of all possible factors affecting ICT integration.

Furthermore, the study is limited to the use of ICT in instructional contexts and does not address ICT usage in administrative or co-curricular activities.

1.10 Limitations of the Study

According to Cohen et al 2018, "limitations are an inherent part of research design and should be acknowledged and addressed".

This study will be limited to selected secondary schools in Zimbabwe which may not be representative of all secondary schools in the country.

The focus will be on Mathematics teachers which may not be representative of teachers in other subjects.

Another limitation will be the lack of generalizability due to the qualitative design. Self-reporting bias in interviews and surveys will militate against the study.

Additionally, limitations in the form of financial constraints, unwillingness by respondents to participate fully are also expected.

Finally, the study may be constrained by variations in ICT availability across schools, which could affect perceptions and usage patterns.

1.11 Definition of key terms

The following terms have been defined in the context in which they will be used in this research project.

ICT (Information and Communication Technology) refers to a broad range of digital tools and systems that are used to process, store, retrieve, and communicate information. In the education context, ICT encompasses devices such as computers, projectors, smartboards, mobile phones, and the internet, used to enhance teaching, learning, and administrative processes.

ICT Tools: refer to technologies, including hardware and software technologies used in teaching and learning (e.g., computers, projectors, simulations, educational apps, GeoGebra, Desmos, Microsoft Mathematics, MathsPad, Sketch Up,).

Pedagogical Beliefs refer to the personal convictions, theories, and values that teachers hold regarding teaching and learning processes. These beliefs shape choices of teaching methods, classroom practices, and welcoming to new ideas such as ICT.

As cited in Nxasana et al 2023, “teachers’ pedagogical beliefs can be broadly categorized into traditional and constructivist beliefs. Traditional beliefs emphasize teacher authority, control and transmission of knowledge, while constructivist beliefs focus on student centered learning, inquiry and discovery.”

Underutilization of ICT occurs when available technologies are not fully or effectively employed in instructional practices” (Zindi & Ruparanganda, 2011). In other words, it refers to the insufficient or ineffective use of ICT tools despite their availability. It often results from lack of training, negative attitudes by teachers, barriers from within, or resistance to change.

Mathematics Instruction encompasses the teaching practices and resources used to help students develop mathematical knowledge and reasoning skills” (Kilpatrick, Swafford, & Findell, 2001). This includes teaching methods, planning and pedagogical approaches used by teachers in the classroom.

ICT Integration involves the use of technology as an essential part of teaching strategies and curriculum delivery, rather than as an add-on (Mishra & Koehler, 2006). It can be thought of as the meaningful and effective use of ICT tools in teaching and learning of learners. It is not just occasional or cosmetic use, but it aims for improvement of learning experiences.

1.12 Summary

Chapter 1 introduces the research topic, "Beyond Access: Exploring Mathematics Teachers' Pedagogical Beliefs and the Underutilization of ICT Tools in Zimbabwean Secondary Schools." It provides the background to the study, highlighting the potential of ICTs in enhancing teaching and learning in mathematics. The chapter also outlines the research problem, purpose, objectives, and questions, as well as the significance and delimitations of the study. Key terms are defined, and assumptions and hypotheses are presented.

CHAPTER 2 LITERATURE REVIEW

2.1 Introduction

The integration of Information and Communication Technologies (ICTs) into education has become a central focus of educational reforms worldwide. However, successful integration goes beyond merely providing access to devices and infrastructure. It depends largely on teachers' beliefs, competencies, and willingness to adapt to pedagogical shifts (Ertmer, 2005). It is not just providing access to computers, tablets, smartboards and related infrastructure. It hinges on how adept or skillful the teachers are. It also depends on how willing they are to embrace new pedagogical practices.

This literature review explores theoretical frameworks and empirical studies on ICT integration in mathematics education at secondary schools. It gives emphasis to pedagogical beliefs and barriers to use of ICT.Particular attention is given to the Zimbabwean context.

2.2 Theoretical Framework

2.2.1 Technological Pedagogical Content Knowledge (TPACK)

The TPACK framework developed by Mishra and Koehler (2006) emphasizes the intersection of technological knowledge (TK), pedagogical knowledge (PK), and content knowledge (CK). Mathematics teachers need to understand that effective ICT integration can support the teaching of mathematical concepts in pedagogically sound ways. TPACK provides a valuable lens for examining how teachers infuse technology with instructional methods and mathematical content.

2.2.2 Ertmer's First- and Second-Order Barriers

Ertmer (2006) differentiates between first-order barriers in ICT integration (external, such as lack of resources, training, and infrastructure) and second-order barriers (internal, such as beliefs and attitudes). While much research has focused on how to deal with first-order barriers, Ertmer argues that second-order barriers are more difficult to address because they are embedded in teachers' personal belief systems and instructional habits.

2.3 ICT Integration in Mathematics Education

Mathematics is a uniquely positioned subject to benefit from ICT tools. This is because technologies like graphing calculators, dynamic geometry software (e.g., GeoGebra), spreadsheets, and simulations can enhance understanding of concepts and visual reasoning. However, studies show that mathematics teachers often use ICT tools for administrative or presentational purposes rather than for engaging students in deep mathematical thinking (Tondeur et al., 2017). Ultimately, this leads to the underutilization of ICT in Mathematics teaching in Zimbabwean Secondary Schools, despite clear pedagogical potential. (Chigama & Goronga, 2022) opined that "Teachers tend to revert to traditional, exam-oriented teaching methods due to curriculum pressure and beliefs about effective mathematics instruction.

2.4 Teachers' Pedagogical Beliefs and ICT Usage

2.4.1 Influence of Beliefs on Instructional Practices.

Pedagogical beliefs refer to a teacher's personal theories about teaching and learning. Research has consistently found that such beliefs influence whether and how teachers integrate technology (Ertmer, 2005). For instance, a teacher who believes that learning mathematics is primarily about rote memorization may see little value in using interactive ICT tools.

Tondeur et al. (2017) argue that beliefs aligned with student-centered learning are more likely to result in effective ICT use. Teachers with constructivist beliefs tend to use technology to facilitate exploration and problem-solving, while those with more traditional beliefs tend to use it for drill-and-practice or to present information.

2.4.2 Beliefs in the Zimbabwean Context.

In Zimbabwe, studies reveal that many teachers in the mathematics arena still hold traditional beliefs about teaching. They view the role of the teacher as the knowledge transmitter and students as passive recipients (Zindi & Ruparanganda, 2011). This teaching orientation often undermines ICT integration, especially when ICT is seen as a "distraction" or unnecessary complication to established routines.

2.5 Barriers to ICT Integration in Zimbabwean Schools

2.5.1 Infrastructure and Access. Manhivi & Zikhali (2020) asserted that "Although ICT policies have been rolled out nationally, many schools, especially in rural and high-density urban areas, still suffer from unreliable electricity, poor internet connectivity, and limited computer access. Mangena and Sibanda (2024) also found that ICT usage in school management was also constrained by similar infrastructural deficits, indirectly impacting teaching practices.

2.5.2 Teacher Training and Professional Development. Limited pre-service and in-service ICT training for teachers remains a persistent issue. Training is often theoretical and lacks specific subject application, particularly for mathematics (Chigama & Goronga, 2022). As a result, teachers feel ill-prepared to integrate ICT into complex Mathematical content areas. Teachers end up being anxious about using technology in front of students.

2.5.3 Curriculum and Examination Pressures. The nature of Zimbabwe's education system is examination driven or exam oriented. This discourages innovation in teaching practices. Teachers are more likely to focus on covering the prescribed syllabus than on exploring creative or technology-enhanced approaches to teaching. This examination culture reinforces traditional beliefs and minimizes incentives for integrating ICT into mathematics classrooms (Zindi & Ruparanganda, 2011).

2.6 Empirical Studies in Zimbabwe and Africa

Studies across Zimbabwe have explored ICT usage in education, but few have focused specifically on mathematics teaching or on the role of pedagogical beliefs. Manhivi & Zikhali (2020) investigated ICT's impact on children's educational opportunities in rural Masvingo and noted underutilization due to lack of trained personnel and a strong belief in traditional methods.

Also, Chigama & Goronga (2022) examined teacher perceptions in Harare primary schools, finding that positive attitudes toward ICT did not always translate to practice due to lack of skills and support. Additionally, Zindi & Ruparanganda (2011) highlighted how science and mathematics teachers perceived ICT as beneficial but were constrained by rigid syllabi, limited access, and lack of training.

Across Africa, similar trends have been observed. For example, Kafyulilo et al. (2015) in Tanzania found that while teachers acknowledged the value of ICT, actual use was minimal due to both external barriers and entrenched pedagogical beliefs.

2.7 Gaps in the Literature

Existing literature acknowledges the influence of beliefs on ICT integration. However, few studies in Zimbabwe have explicitly explored how mathematics teachers' pedagogical beliefs shape ICT usage. Much of the research focuses on general teacher attitudes or infrastructural issues. Moreover, studies often treat beliefs as secondary to access and training, rather than as a central determinant of technology utilization. This study addresses this gap by:

a) Focusing specifically on mathematics teachers;

b) Exploring beliefs as a primary explanatory variable for underutilization;

c) Providing qualitative insights into why teachers use or avoid ICT in instructional practice.

2.8 Conceptual Framework

Based on the existing literature, the following conceptual framework guides this study:

a) Inputs: Access to ICT, training, school leadership support.

b) Mediators: Teachers' pedagogical beliefs, attitudes toward technology, self-efficacy.

c) Outcomes: Degree and nature of ICT use in mathematics instruction.

The framework posits that pedagogical beliefs act as a filter through which other factors (like training, access, resources and leadership support) are interpreted and applied.

2.9 Summary

This chapter has examined key theoretical and empirical literature relevant to ICT integration in mathematics education. It highlights the central role of pedagogical beliefs as both enablers and barriers to technology use. Despite infrastructural progress, Zimbabwean mathematics classrooms often reflect underutilization of ICT due to entrenched traditional beliefs and inadequate support for pedagogical change. Addressing these belief systems is critical for meaningful integration of ICT in teaching and learning.

CHAPTER 3 RESEARCH METHODOLOGY

3.1 Introduction

This chapter describes the methodology used to explore mathematics teachers' pedagogical beliefs and the underutilization of ICT tools in Zimbabwean secondary schools. It presents the research design, population, sampling procedures, data collection instruments (questionnaire and interviews), data collection and analysis methods. Additionally, ethical considerations and limitations of the study are discussed.

The primary aim of this research is to explore how mathematics teachers' pedagogical beliefs influence the underutilization of available ICT tools in Zimbabwean secondary schools. To achieve this, a combination of quantitative and qualitative research methodology was employed, allowing for in-depth exploration of beliefs, attitudes, and contextual influences.

3.2 Research Paradigm

The study adopted a mixed-methods approach, integrating both quantitative (positivist) and qualitative(interpretivist) paradigms.

3.2.1**. Qualitative research** involves collecting and analyzing non-numerical data to gain insights into people's experiences, perceptions, and behaviors (Creswell, 2014). It is, thus, a method that tries to understand the social world through how people experience and perceive the world around them.

The qualitative component of the research used semi-structured interviews which explores deeper understandings and contextual factors influencing ICT use.

3.2.2**. Quantitative research** involves collecting and analyzing numerical data to test hypotheses and identify patterns (Creswell, 2014). It is a systematic and empirical approach to investigating phenomena through collecting numerical data
The quantitative component of the research used a structured questionnaire to measure access, usage patterns, and beliefs statistically.

This integration of both paradigms ensured both breadth and depth in understanding teachers' pedagogical beliefs and ICT utilization.

3.3 Research Design

A descriptive survey design supplemented by semi-structured interviews was employed.

Justification:

The survey provides quantifiable information about ICT access and use.

Interviews provide deeper explanations of beliefs, challenges, and practices, allowing triangulation and richer interpretation.

3.3.1. **Advantages and Disadvantages of the Methodology**

3.3.1.1**. Advantages**

a) Mixed methods provide both quantitative breadth and qualitative depth

b) Enables triangulation for validity and reliability

c) Provides both statistical and narrative insights

d) Enhances understanding of beliefs, access, and barriers in context.

3.3.1.2**. Disadvantages**

a) Time-consuming and requires more analysis skills.

b) Risk of inconsistency between data types.

c) Self-reporting may introduce bias.

d) Requires careful coordination of data collection phases.

3.4 Population, Sampling and Sampling Techniques

Study population refers to a group of respondents or objects in the research study who have similar characteristics in one or more ways and form the subject of the study(Muvakana,2018).

3.4.1**. Target Population**: The target population included secondary school mathematics teachers and learners in Zimbabwe, particularly those teaching in urban and peri-urban schools where ICT resources may be available but underutilized. The broader population included school heads who helped provide insight into school policies and support structures.

3.4.2**. Accessible Population**: Mathematics teachers, secondary school heads and learners in selected schools from Harare province.

3.4.3. **Sampling Techniques**

Brink (2021) defines a study sample in a research as a subset of a population and advises that the researcher should determine the type of population, its accessibility and the best method it can be sampled (into a small group). Muvakana (2018) reiterate that the selected small group (sample of people) are known as respondents. Respondents are people who give data which is to be used for analysis of the research study

The following sampling methods were used:

3.4.3.1**. For Questionnaire**: Stratified random sampling (urban/peri urban, government/private schools, township/low density).

3.4.3.2**. For Interviews** Purposive sampling technique were used to select participants who are directly involved in teaching mathematics, have access to ICT tools in their schools and with varying ICT experience. This non-probability method ensured that participants are information-rich and relevant to the research objectives (Patton, 2015).

3.4.4**. Sample Size**

The sample comprised:

3.4.4.1**. For Questionnaires**

10 mathematics teachers from ten secondary schools (two teachers per school).

5 school managers (one per school)-drawn from the ten secondary schools

5 mathematics learners from five secondary schools (one learner per school).

The sample size, though limited, allowed for data saturation in qualitative inquiry and reflects the exploratory nature of the study. Additionally, the data allowed for verification of response and triangulation.

3.4.4.2**. For Interviews**:

5 teachers (drawn from questionnaire participants)

3.5 Research Instruments

Two main instruments were used: **Structured Questionnaire** – for quantitative data collection and **Semi-Structured Interview Guide** – for qualitative insights.

Semi-structured interviews were conducted with secondary school mathematics teachers and school management team. This format allowed for flexibility while ensuring consistency across participants.

3.5.3**. Focus Questions were on:**

3.5.3.1. Teachers' pedagogical beliefs.

3.5.3.2. Perceived role of ICT in mathematics education.

3.5.3.3. Challenges and motivations for ICT usage.

3.5.4**. Supplementary questions(checklist)** were on:

3.5.4.1. Frequency and type of ICT tool usage.

3.5.4.2. Integration of ICT into lesson delivery.

3.5.4.3. Teacher-student interaction around ICT tools.

Data collection tools were pretested and refined for clarity, reliability, and validity.

3.6 Questionnaire Design

The questionnaire contained both closed and open-ended items, allowing descriptive statistics and limited qualitative comments.

Furthermore, the questionnaire was divided into five key sections:

Section	Focus area
A	Demographic information
B	Access to ICT tools
C	Pedagogical beliefs about ICT integration
D	Frequency and types of ICT use
E	Barriers and support mechanisms

3.7 Data Collection Procedures.

The researcher made use of one research assistant to assist in administering both the questionnaire and survey. These were designed to capture all the necessary unavailable information on exploring the effect of pedagogical beliefs on ICT integration in mathematics teaching and learning. The researcher requested permission from the school headmasters where appropriate and was granted permission to enter schools for research purposes. This made all the work much easier.

The following procedures was followed in the course of data collection:

1. Obtaining ethical clearance and permissions from education authorities.

2. Seeking consent from school heads and participants.

3. Administering questionnaires (paper-based or Google Forms).

4. Selecting participants for follow-up interviews.

5. Conducting and recording interviews (informed consent, voluntary, anonymity and confidentiality).

6. Transcribing and coding qualitative data.

7. Securely storing all data for confidentiality.

3.8 Ethical Considerations

Ethical considerations are the moral principles and values that guide the research process, ensuring that participants are treated with respect and dignity (Zindi ,2011). These are guidelines that researchers follow to make sure they work morally and responsibly.

The study adhered to ethical standards as outlined below:

3.8.1 **Informed Consent**: All participants were fully informed of the study's purpose. Written consent was obtained from all participants after explaining the purpose, procedures, and confidentiality measures.

3.8.2 **Voluntary Participation**: Participants were informed of their right to withdraw at any time.

3.8.3 **Anonymity**: No identifying information will be disclosed. Pseudonyms were used for schools and participants

3.8.4 **Confidentiality**: Data will be stored securely and used only for research purposes.

3.8.5 **Respect and Integrity**: Findings will be reported truthfully.

3.8.6 **Approval**: Ethical clearance was obtained from the university research ethics personnel and the Ministry of Primary and Secondary Education in Zimbabwe.

3.9 Reliability and Validity

3.9.1 **Questionnaire Reliability**

The reliability of the questionnaire was tested through Cronbach's Alpha (target ≥ 0.70 acceptable).

3.9.2 **Interview Validity**

Validity was achieved through member checking (participants review summaries) and triangulation between questionnaire and interview findings.

3.9.3 **Trustworthiness of the Study**

To ensure rigor and credibility in the qualitative part of the research, the following strategies were used:

Criteria	**Strategy Used**
Credibility	Triangulation (interviews, observations, documents); member checking
Transferability	Thick descriptions of context and participants
Dependability	Audit trail of data collection and coding process
Confirmability	Reflexivity and use of verbatim quotes from participants

3.10 Limitations of the Methodology

3.10.1 **Limited to a selected province**: results may not generalize nationwide.

3.10.2 **Self-report bias** during interviews affect responses.

3.10.3 **Observer effect**: Presence of the researcher during classroom observations may influence teacher behavior.

3.10.4 **Internet access** may limit online survey participation.

3.10.5 **Researcher bias** may influence interpretation of qualitative data (minimized through peer review).

3.10.6 **Small sample size** limits generalizability; however, this is typical in qualitative research.

3.11 Data Analysis Plan and Triangulation

Collected questionnaire data was entered into Excel. Analysis included the following categories:

1)**Descriptive statistics** to summarize demographics, access and usage for example, frequency, mean, percentages.

2)**Inferential statistics** to identify relationships between beliefs, access, and use, for example, Correlation, Chi-square.

3.11.1. Data Analysis and Presentation

Data analysis is chiefly determined by the research methodology that the researcher used, that is, questionnaires and survey which produced different types and amounts of data. Muleya (2018) posit that surveys habitually encompass the use of multivariate analysis for the determination of associations between variables. The main objective of data presentation is to interpret data and present it in a specific form that enhances understanding of collected data. Collected data was scrutinized using, among other forms, tables, bar graphs and pie charts. Findings are displayed in various types of tables and graphs.

3.11.2 Tables and figures:

Tables and figures were used to summarize collected data. Tabulated data helps to reduce amount of text and to simplify the relationships between variables. The major merit of tables and figures is that it enables the easiest and most effective ways of presenting huge amounts of information, and excel packages make the design and manipulation of tables easy (Muleya, 2018). Tables are in general easily understood by many people.

3.11.3 Bar graphs and pie charts:

Several bar graphs and pie charts were used to visualize the data. Tables and Pie charts show the comparisons of maxima and minima levels clearly and have proven to be easy to interpret and highlight underlying patterns. According to Crawshaw and Chambers (2018), bar graphs have bars of equal width and can be either vertically or horizontally constructed; thus, the patterns can be seen more clearly with some form of pictorial representation. Pie charts are simple pictorial diagrams that are used for comparisons of limited amounts of information as proportion and percentages.

3.11.4. Qualitative Data Analysis

Interview transcripts had to undergo thematic analysis, following Braun & Clarke's (2006) six-step framework as listed below:

1. Familiarization with data (reading and re-reading transcripts).

2. Generating initial codes

3. Searching for themes (e.g., "beliefs about ICT," "barriers," "institutional support").

4. Reviewing themes

5. Defining and naming themes

6. Writing the narrative report with quotes from participants

NVivo software was used to manage and code qualitative data.**Key themes were expected to emerge around**:

a) Teachers' beliefs about teaching and learning.

b) Attitudes toward ICT.

c) Institutional support and policy alignment.

d) Barriers to and enablers of ICT integration.

3.11.5 Data Triangulation

"Triangulation is the process of using multiple data sources, methods, or investigators to validate and corroborate findings" (Creswell, 2014). It is a strategy for improving the validity of research findings by using differing methods, data sources, or investigators, ensuring credibility, dependability, and confirmability of findings. Three types of triangulation were used in this study:

a) **Methodological triangulation**: Comparing questionnaire and interview results to confirm consistency.

b) **Data source triangulation**: Considering responses from teachers, school managers as well as learners' responses across different school types.

c) **Interpretive triangulation**: Peer debriefing and literature cross-checking to minimize researcher bias.

3.12 Summary

This chapter outlined the methodological framework for investigating mathematics teachers' pedagogical beliefs and ICT underutilization in Zimbabwean secondary schools. It detailed the mixed-methods approach, instruments, sampling, data collection, ethical considerations, and data analysis plan.

CHAPTER 4 DATA PRESENTATION AND ANALYSIS

4.1 Introduction

This chapter presents the findings from data collected through Teachers' questionnaires, learners' questionnaires, Managers' questionnaires, semi-structured interviews and document analysis. The study explored how mathematics teachers' pedagogical beliefs influence the underutilization of ICT tools in Zimbabwean secondary schools. The analysis is guided by the research objectives and framed through thematic analysis, following Braun and Clarke's (2006) approach. Data excerpts are presented verbatim to give voice to participants and enhance credibility.

4.2 Overview of Participants

A total of 15 participants were involved:**10 mathematics teachers** from eight secondary schools,**5 school heads** (one per school),**5 learners** from 5 different schools.

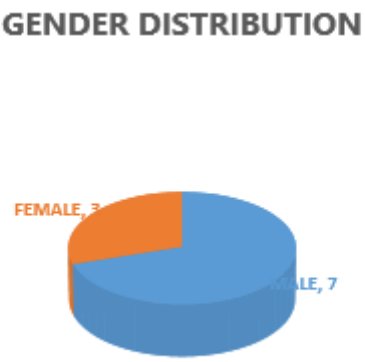
Participants came from schools with varying ICT access levels but similar contextual pressures including syllabus coverage, exam orientation, large classes, and resource limitations—patterns also observed in earlier studies on Zimbabwean schooling contexts (Zindi & Ruparanganda, 2011; Mpofu & Shumba, 2022).

4.3 Mathematics Teachers' Demographic Information.

4.3.1 Gender Distribution

70% male and **30% female**, reflecting national trends where mathematics teaching is male-dominated

Figure 4.1 Gender distribution



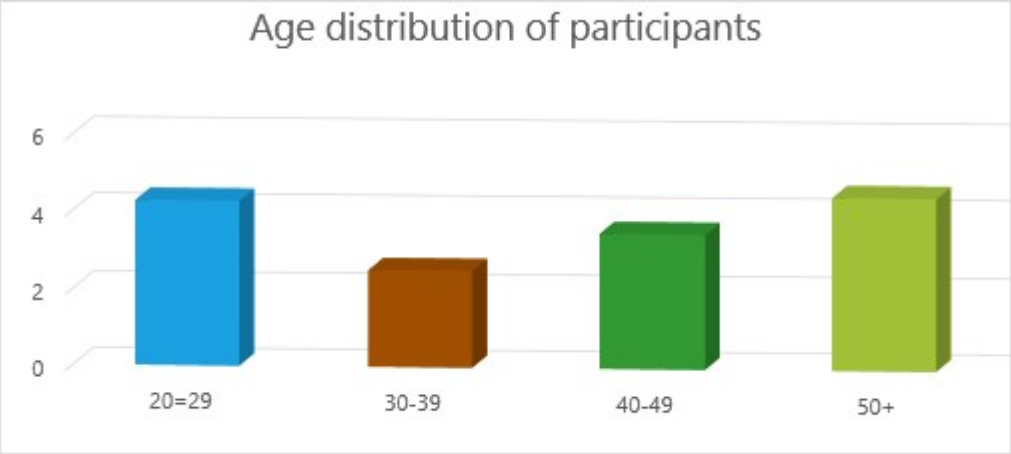
4.3.2 Age Distribution

Teachers ranged from early-career (20–29 years) to veteran educators (50+), which later helped interpret differences in ICT confidence—consistent with Tondeur et al. (2017), who noted that younger teachers often display higher digital readiness.

Table 4.1 AGE INFORMATION

AGE DISTRIBUTION	FREQUENCY
20-29	2
30-39	4
40-49	3
50+	1

Figure 4.2 Age distribution of participants



4.4 Availability of ICT Tools: Triangulated Evidence.

4.4.1 Quantitative Findings (Questionnaires)

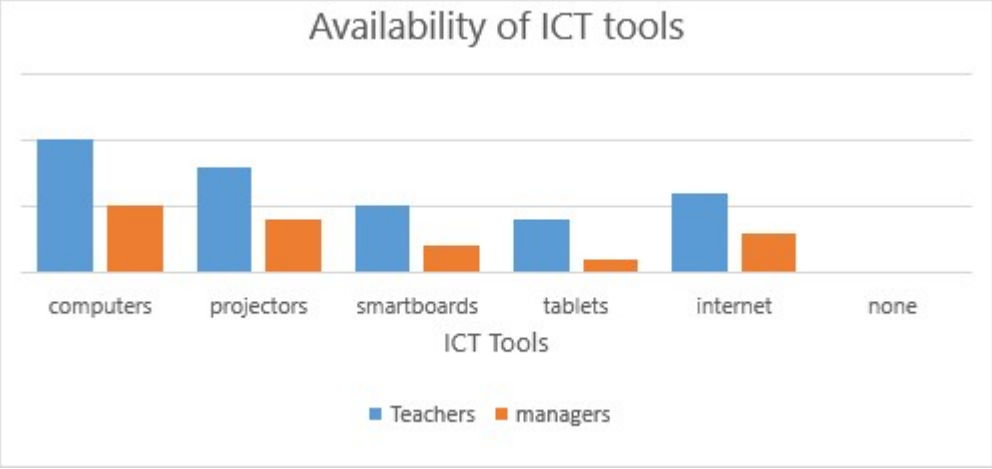
Computers were the most available ICT tool, reported by **100% of teachers** and **all 5 managers**. Tablets and smartboards were less common.

Summarized findings

Table 4.2 Accessible/available ICT in schools (out of 10)

ICT Tools	Teachers(n=10)	Managers(n=5)
computers	10	5
projectors	8	4
smartboards	5	2
tablets	4	1
internet	6	3
none	0	0

Figure 4.3 Availability of ICT tools



The data reveals that both teachers and managers reported a high access to computers but a lower access to smartboards and tablets. No school had zero access to ICT tools. This suggests that while there is a good foundation of computer infrastructure, there is need for more specialized tools like smartboards and tablets to support mathematics teaching.

4.4.2 Interview Confirmation

Interviews confirmed these statistics: several teachers reported that although the school "*has computers*," they are often "*locked in the computer lab*," or reserved exclusively for Computer Studies. Observation notes also recorded two schools where smartboards had been unused for over a year due to technical faults.

4.4.3 Document Analysis

School inventories corroborated questionnaire data, revealing ICT donations from NGOs or government programs, but with minimal evidence of usage logs or maintenance schedules.

4.4.3.1.Triangulation Insight:
Availability does not equal usability. ICT infrastructure exists, but its accessibility is inconsistent, supporting Zindi & Ruparanganda's (2011) argument that many African schools have "hardware without integration."

4.5 ICT Usage by Teachers.

4.5.1 Questionnaire Results
4.5.1.1. ICT USAGE BY 10 MATHEMATICS TEACHERS

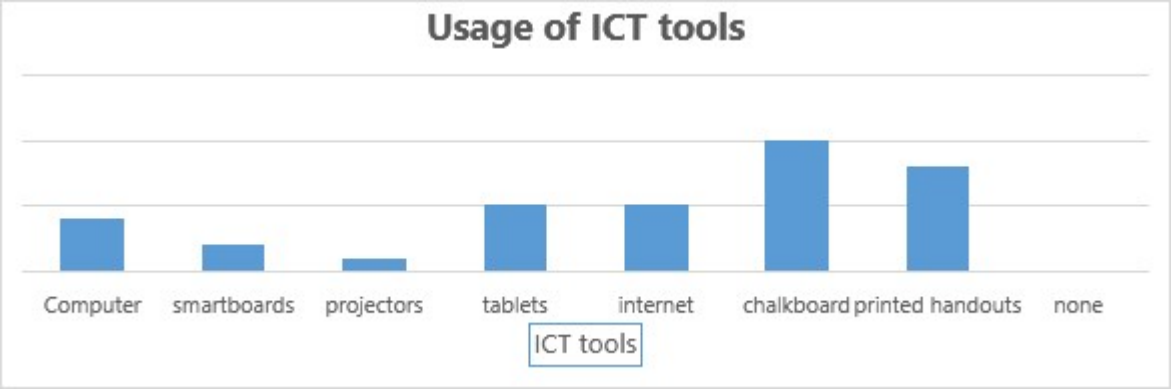
Despite availability:

Chalkboard use = 100%, Printed handouts = 80%, Computer use = 40%, Smartboard use = 20%

Table 4.3 ICT usage by mathematics teachers

ICT usage	computers	smartboards	projectors	tablets	internet	chalkboard	Printed handouts
Number	4	2	1	5	5	10	8

Figure 4.4. Usage of ICT tools



The data shows that all teachers use the traditional chalk board as a primary teaching tool. A high number of teachers also resorted to printed handouts. While teachers have access to computers and smartboards they do not prioritize using them as much as they could.

4.5.2 Interview Insights

Interviews revealed that ICT use is episodic. One teacher highlighted: *"I only use the projector when introducing a new topic, then I return to the board."* This confirms questionnaire data showing weekly or monthly ICT usage.

4.5.2.1. Frequency of use of ICT tools

Table 4.4. Frequency of use of ICT tools

Frequency	Teachers	Managers
Daily	1	0
Weekly	4	1
Monthly	4	2
Rarely	1	2
Never	0	0

ICT tools are used less frequently by teachers with only one teacher out of ten using it daily. This observation was collaborated by data from was supported by managers' responses who reported that no teacher used ICT on a daily basis in teaching mathematics. The majority of teachers used ICT tools in Mathematics instruction weekly and monthly. This appears to suggest that ICT usage is treated as peripheral and not as an integral part of daily lesson delivery.

4.6.Pedagogical Beliefs

The following data collected from Both teachers and school managers also shows that teachers do not prioritize the use of ICT tools:

4.6.1.Summary of data from mathematics teachers

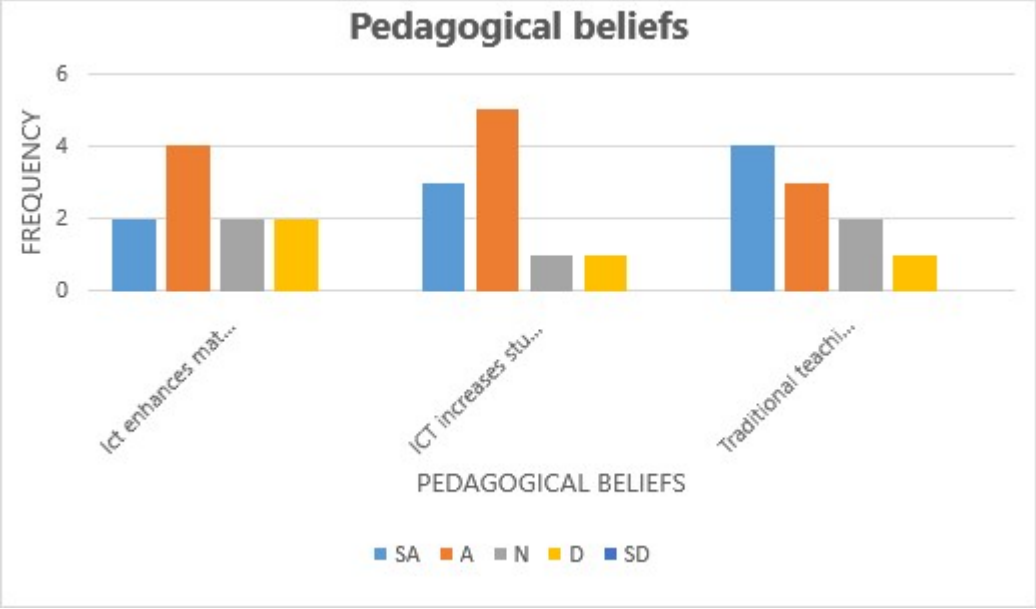
Table 4.5 Pedagogical beliefs

PEDAGOGICAL BELIEF	SA	A	N	D	SD
Ict enhances mathematical understanding	2	4	2	2	0
ICT increases student engagement	3	5	1	1	0
Traditional teaching is more effective	4	3	2	1	0

Key

Strongly Agree =SA Agree =A Neutral= N Disagree= D Strongly Disagree= SD

Figure 4.5. Pedagogical beliefs of Mathematics teachers



4.6.2.Summary of data from school managers

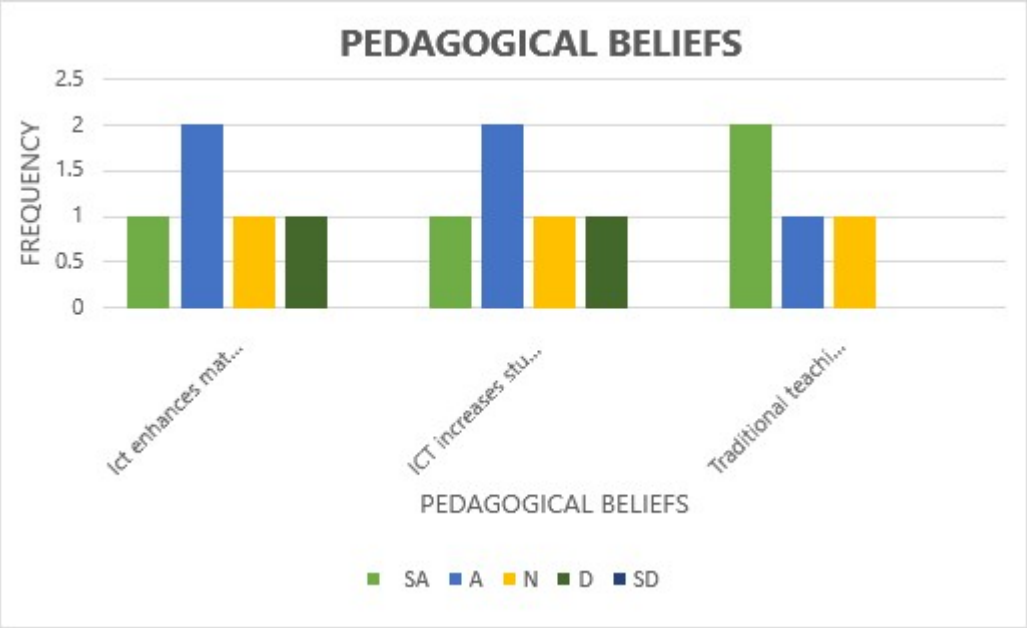
Table 4.6 Pedagogical beliefs:views of school managers

Pedagogical beliefs	SA	A	N	D	SD
Ict enhances mathematical understanding	1	2	1	1	0
ICT increases student engagement	1	2	1	1	0
Traditional teaching is more effective	2	2	1	0	0

Key

Strongly Agree =SA Agree =A Neutral= N Disagree= D Strongly Disagree= SD

Figure 4.6 Pedagogical beliefs: views of school managers



4.6.3. Quantitative Summary

6 out of 10 teachers agreed that ICT enhances mathematical understanding(with 2 strongly agreeing while 4 agreeing).No teacher disagreed.Teachers do realise the importance of ICT in enhancing Mathematics understanding.

Majority of teachers(8 out of 10) also concurred that ICT increases student engagement in Mathematics lessons.Three teachers strongly agreed whilst five teachers agreed.One techer was neutral while only one teacher disagreedcompletely.

Although **60%** of teachers agreed that ICT enhances understanding and **80%** agreed it increases engagement, **70%** still believed **traditional teaching is more effective**.

4.7. Teachers' interview guide interpretation

4.7.1. Theme 1: Pedagogical Beliefs about Mathematics Teaching

4.7.1.1 Traditional Beliefs Dominate

Most teachers held traditional, teacher-centered views about how mathematics should be taught. There was a common belief that mathematics requires "seriousness," "direct instruction," and "chalk-and-talk" methods to cover content effectively.

Example 1: *"I believe in step-by-step explanations on the board. That's how I learned. Technology can be confusing for these kids."* It is quite clear that these beliefs reflect second-order barriers (Ertmer, 2005), where internal convictions about teaching override the potential benefits of ICT integration.

4.7.1.2 Resistance to Student-Centered Methods

Some teachers expressed discomfort with student-centered pedagogies often associated with ICT use. Quoting one teacher:

Example 2: *"When you give students control, they get distracted. It's better when I explain and they follow*."

4.7.2 Theme 2: Perceptions of ICT in Mathematics Instruction

4.7.2.1 ICT Viewed as Supplementary, Not Essential

While teachers acknowledged that ICT can help "demonstrate" or "visualize" certain concepts, they rarely saw it as integral to pedagogy. One teacher had this to say:

Example 3: *"I sometimes use videos when introducing a topic like Pythagoras. But after that, I go back to the board."*

4.7.2.2 Misalignment Between ICT Tools and Curriculum Demands

Some teachers felt that ICT tools did not align well with the exam-oriented Zimbabwean syllabus. An interesting observation was made by one teacher when he said:

Example 4: *"You can't waste time showing students animations when the exam wants them to solve by hand."*

This reflects how systemic pressures e.g., exams and syllabus completion reinforce beliefs that devalue ICT's pedagogical role.

4.7.3 Theme 3: Barriers Reinforcing Beliefs
4.7.3.1 Limited Professional Development

Few teachers reported receiving subject-specific ICT training. Most ICT workshops were described as "general," "theoretical," or "focused on computer literacy" rather than classroom integration. For example, a teacher pointed out that training on ICT use was not specific to the subject of mathematics.

Example 5"We were trained on how to use Word and Excel, not how to teach mathematics with technology." This gap contributes to low ICT self-efficacy, reinforcing avoidance behavior.

4.7.3.2 Inadequate Infrastructure and Technical Support

Although some schools had received ICT donations, lack of maintenance and support discouraged use of ICT tools in Mathematics teaching. Lack of support in terms of trouble shooting and repairs results in ICT tools lying idle and desolate. In some schools, ICT labs are locked or used only for computer studies.

4.7.4 Theme 4: Institutional and Policy Dynamics
4.7.4.1 ICT Integration Not Prioritized by Leadership

Majority of schools have no functioning ICT committees, and almost none have monitoring of classroom-level ICT usage.

4.7.4.2 Exam-Oriented Curriculum Reinforces Traditional Teaching

Mathematics teachers acknowledged that the national curriculum's emphasis on standardized exams stifled innovation. This creates a feedback loop where teachers' beliefs remain unchallenged by system-level expectations.

4.8. Interpretation with Literature

Ertmer's (2005) **second-order barriers** (beliefs, attitudes, values) explain this paradox: even when teachers acknowledge ICT benefits, deep-rooted beliefs about "correct" mathematics teaching override adoption.
Mishra & Koehler's (2006) **TPACK framework** also highlights that teachers may know the content and technology separately, but lack the integrated pedagogical understanding to merge them effectively.

4.9.Barriers to ICT Integration

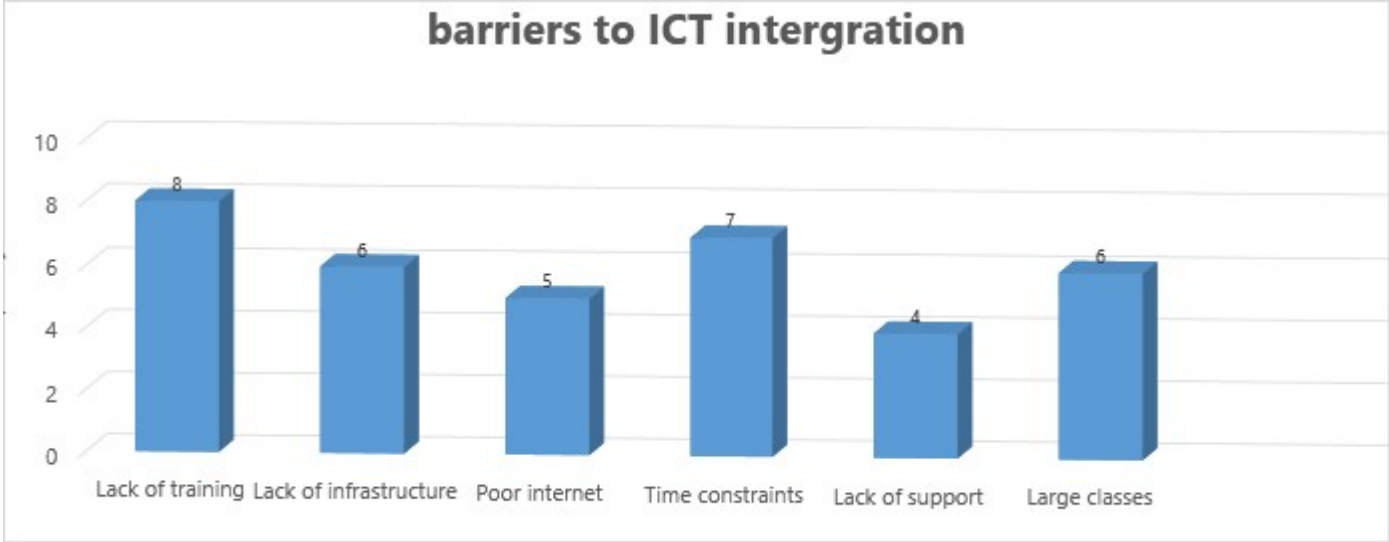
In trying to understand why teachers were reluctant to implememnt ICT usage in Mathematics instruction data was collected and the following summary is presented.

4.9.1.Sumarised data collected from mathematics teachers

Table 4.7 Barriers reinforcing beliefs

Barriers to ICT intergration	Frequency
Lack of training	8
Lack of infrastructure	6
Poor internet	5
Time constraints	7
Lack of support	4
Large classes	6

Figure 4.7 Barriers reinforcing beliefs

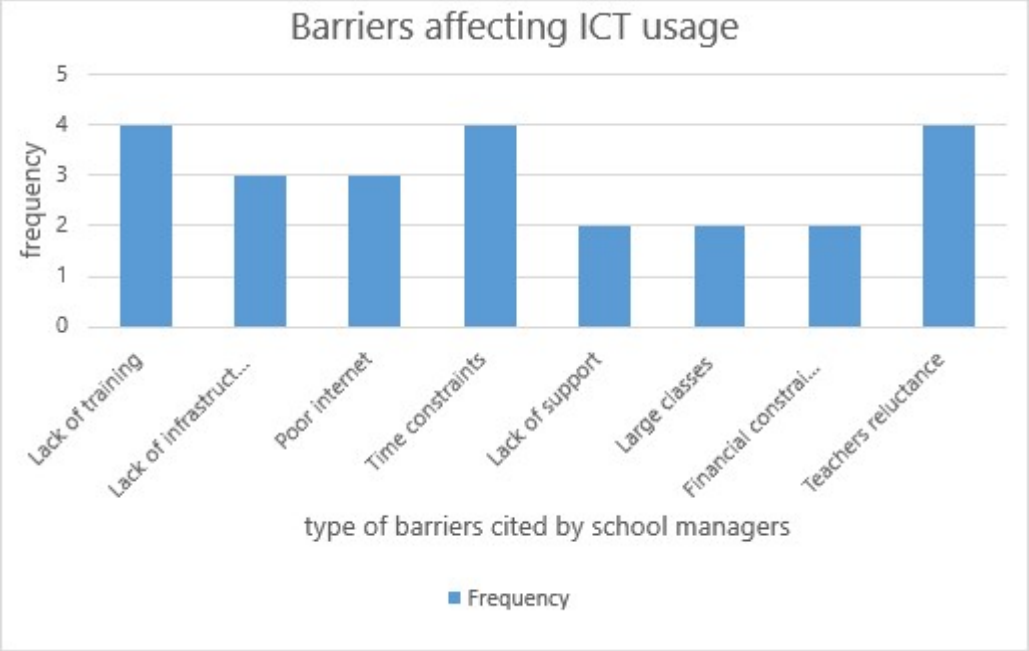


4.9.2.Summarised data collected from School Managers

Table 4.8 Barriers reinforcing beliefs

Type of barrier	Frequency
Lack of training	4
Lack of infrastructure	3
Poor internet	3
Time constraints	4
Lack of support	2
Large classes	2
Financial constraints	2
Teachers reluctance	4

Figure 4.8. Barriers reinforcing beliefs



The analysis of the barriers to ICT usage reveals several important findings.

a)Lack of Training. Firstly, lack of training is a significant barrier, with 8 out of 10 teachers and 4 out of 5 school managers citing it as a major obstacle. One teacher highlighted: *"We were trained on Word and Excel, not how to teach mathematics with ICT."*This suggests that teachers may feel unprepared to effectively integrate ICT tools into their lessons, highlighting the need for professional development opportunities. As one school manager noted, "Regular training on ICT integration in Mathematics lessons" is necessary for teachers to build their confidence and

skills. This finding suggests that teachers may be willing to use ICT tools, but they lack the necessary skills and knowledge to do so.

b)Time Constraints

Furthermore, time constraints are another major barrier, with 7 out of 10 respondents identifying it as a challenge. This is likely due to the pressure to cover a large amount of content in a limited amount of time, leaving little room for ICT integration. One respondent mentioned, "Time constraints are a major issue, we have to prioritize covering the syllabus."

c)Large Classes

Large classes are also a significant barrier, with 6 out of 10 teachers and 2 out of 5 school managers citing it as a challenge. This can make it difficult for teachers to manage the classroom and ensure that all students are engaged when using ICT tools. As one respondent stated, "Large classes make it difficult to effectively use ICT tools, it's hard to manage the students and ensure they're on task."

d)Lack of Infrastructure

Additionally, lack of infrastructure is another significant barrier, with 6 out of 10 teachers and 3 out of 5 school managers identifying it as a challenge. This includes inadequate access to computers, projectors, smartboards, tablets and internet connectivity, which can hinder the effective use of ICT tools. This is reflected in the graph, which shows that while computers and projectors are available, smartboards and tablets are scarce. One teacher noted, "We don't have enough computers for all the students, it's frustrating when we try to use them."

e)Poor Internet

Also, poor internet connectivity is also a barrier, with 5 teachers and 3 school managers citing it as a challenge. This can make it difficult for teachers to access online resources and use ICT tools in their lessons. As one respondent stated, "The internet is often slow or unavailable, it's hard to plan lessons that rely on it."

f)Financial Constraints

Financial constraints are another barrier, with 2 out of 5 school managers citing it as a challenge. This can limit the availability of ICT resources and infrastructure, making it difficult for teachers to use ICT tools effectively.

g)Teachers' Reluctance

Teachers' reluctance is also a barrier, with 4 out of 5 school managers identifying it as a challenge. This suggests that some teachers may be resistant to changing their traditional teaching methods and incorporating ICT tools into their lessons.

h) **Lack of support**

Finally, lack of support is also a barrier, with 4 out of 10 respondents identifying it as a challenge. This includes inadequate technical support and lack of administrative support, which can make it difficult for teachers to troubleshoot issues and implement ICT tools effectively. One respondent mentioned, "We need more technical support, it's frustrating when things don't work and there's no one to help."

4.9.3.Triangulation Insight:

Multiple sources confirm that lack of training, weak infrastructure, and exam pressure reinforce traditional teaching, substantiating findings by Tondeur et al. (2017) and Chigama & Goronga (2022).

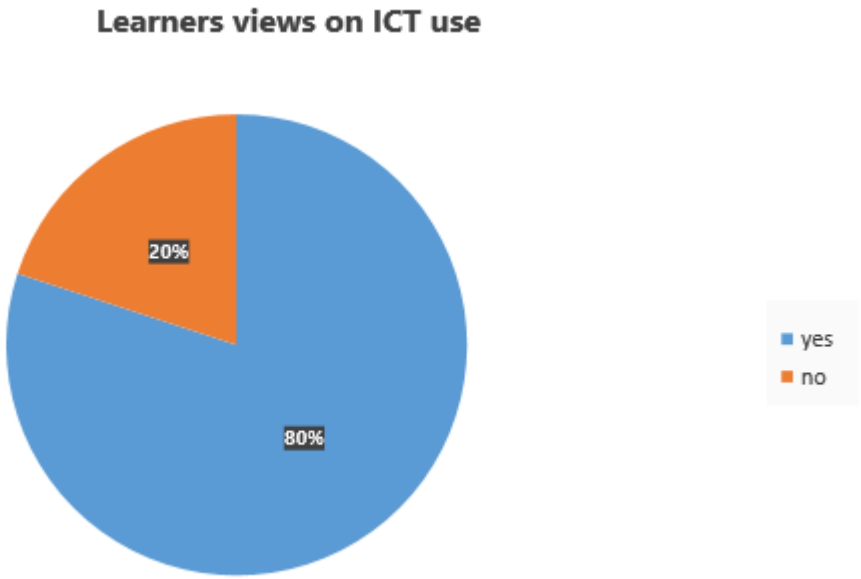
4.10. Learners' Questionnaire: Triangulated Analysis.

4.10.1 Learners' Views on Increased ICT Use (Question 9)

Table 4.9 learner's beliefs on ICT use

Response	Frequency	Percentage
Yes	4	80%
No	1	20%

Figure 4.9 Learner's beliefs on ICT use



A strong **80%** of learners want more ICT use, suggesting high learner readiness, contrasting sharply with teachers' hesitant beliefs.

4.10.2 Common ICT Tools Used (Question 10)

Learners indicated that teachers use **a narrow range of tools**, mainly PowerPoint.

Table 4.10 Common ICT tools used: view of learners

Tool	Frequency	Percentage
PowerPoint	2	40%
GeoGebra	1	20%
Online videos	1	20%
Excel	0	0%
Simulations	0	0%
None	1	20%

4.10.3 ICT Activities (Question 11)

Table 4.11 ICT activities used by teachers: view of learners

ICT Activity	Frequency	Percentage
Demonstrations	2	40%
Practice Exercises	1	20%
Group Projects	1	20%
Online Assessments	0	0%
None	1	20%

Activities were mostly teacher-centred, matching teachers' reports and beliefs.

4.11 Triangulation of Findings.

4.11.1 Key Convergences Across Data Sources.

Table 4.12 Convergence of data

Data Source	Converging Finding
Teachers	ICT is supplementary, not essential
Managers	Teachers prefer traditional methods
Learners	Want more ICT use (80%)
Observations	ICT used only occasionally
Documents	No evidence of structured ICT integration

4.11.2. Triangulation Insight:

Learners' positive attitudes further highlight belief-based barriers among teachers. Despite infrastructure, teaching remains traditional. All three respondent groups confirm:

a) Low ICT use

b) Belief-driven resistance

c)Infrastructure-access mismatch.

4.12 Emerging Patterns and Summary of Key Findings

4.12.1 Pedagogical Beliefs Are Central. Teachers' core beliefs about how mathematics should be taught play a dominant role in shaping instructional choices, often overriding access or training. Teachers adhere to teacher-centred, content-focused pedagogy. This mirrors Shulman's (1987) argument that teachers teach "as they were taught."

4.12.2 ICT Perceived as a Luxury, not a Necessity. ICT is generally viewed as a helpful extra, not a core component of effective teaching. ICT is regarded as supportive only during topic introduction, consistent with findings by Ottenbreit-Leftwich & Ertmer (2010). This belief is deeply embedded and reinforced by curriculum demands and exam pressures.

4.12.3 External Barriers Reinforce Internal Ones. Infrastructure challenges, time pressure, lack of support and lack of targeted professional development strengthen teachers' reluctance to adopt ICT, validating their belief that traditional methods are more reliable.

4.12.4 Policy-Practice Gaps Exist. Despite national ICT policies, implementation at school level remains weak, with no clear accountability or support structures to promote integration. School policies mention ICT but lack operational guidelines, echoing Manhivi & Zikhali's (2020) findings on weak policy implementation.

The findings show that mathematics teachers' pedagogical beliefs and internal and external barriers hinder the effective use of ICT tools, despite having access to them. The major barriers to ICT integration are lack of training, time constraints, and teachers' reluctance. Overall, these findings suggest that addressing these barriers will be crucial to increasing the effective use of ICT tools in Mathematics lessons.

4.13 Linking Findings to Research Questions

RESEARCH QUESTION	KEY FINDINGS
4.13.1.What are the prevailing pedagogical beliefs among mathematics teachers in Zimbabwean secondary schools?	Dominantly teacher-centered, exam-focused, resistant to ICT-based, student-centered methods.
4.13.2. How do these pedagogical beliefs influence the integration, or lack thereof, of ICT tools in mathematics teaching?	Teachers avoid ICT due to beliefs that it wastes time, distracts learners, or doesn't align with exams.
4.13.3. What external (contextual) and internal (psychological or experiential) factors shape these beliefs?	Internal: Past experience, ICT self-efficacy. External: Curriculum demands, lack of training, poor infrastructure.
4.13.4. How can teacher training and policy interventions address these belief-related barriers to ICT integration?	Findings suggest need for subject-specific, belief-challenging professional development, and policy implementation beyond infrastructure provision

4.14 Summary

This chapter presented, triangulated and analyzed findings from questionnaires, vis a vis, teachers' questionnaire, managers' questionnaire and learners' questionnaire, interview guides, observations, and documents. It revealed a complex interplay of beliefs, structural constraints, and systemic pressures contributing to ICT underutilization in mathematics education. It further revealed that mathematics teachers' pedagogical beliefs in Zimbabwean secondary schools are deeply rooted in traditional, exam-driven paradigms. These beliefs, to a large extent, significantly contribute to the underutilization of ICT tools in Zimbabwean schools, even where infrastructure exists. Findings are consistent with international and regional studies on ICT integration barriers. In particular, the findings align with Ertmer's (1999, 2005) framework on second-order barriers, emphasizing that beliefs, not just access, must be targeted for meaningful ICT integration in education.

CHAPTER 5 DISCUSSIONS, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter interprets and discusses the findings of the study, linking them to existing literature, the research questions, and the theoretical frameworks presented earlier. The study aimed to explore how mathematics teachers' pedagogical beliefs contribute to the underutilization of ICT tools in Zimbabwean secondary schools. The discussion is structured according to the main themes identified, followed by conclusions and practical recommendations.

5.2 Discussion of Major Findings

5.2.1 Prevailing Pedagogical Beliefs among Mathematics Teachers

The study found that teacher-centered and exam-driven pedagogical beliefs dominate among secondary school mathematics teachers in Zimbabwe. These beliefs prioritize teacher authority content coverage, rote learning, chalk-and-talk methods and direct instruction over exploratory or interactive approaches supported by ICT. This aligns with Ertmer's (2005) concept of second-order barriers, where internal belief systems become significant obstacles to change.

Teachers expressed skepticism about the compatibility of ICT with mathematics instruction, particularly in high-stakes examination contexts. This finding echoes studies by Zindi and Ruparanganda (2011) and Tondeur et al. (2017), which found that traditional beliefs remain the strongest predictor of ICT integration and often undermine attempts at pedagogical innovation, especially in exam-focused education systems.

Shulman (1987) supports this by pointing out that teachers teach the way they themselves were taught, reinforcing traditional, non-technological pedagogies.

5.2.2 Influence of Beliefs on ICT Integration

The research confirms that pedagogical beliefs are a key determinant of ICT integration. Teachers who believe that effective mathematics teaching requires rigid control and precision tend to avoid technologies that enable exploration or student autonomy. Even when infrastructure is available, these beliefs act as a filter through which teachers interpret the value and utility of ICT tools (Ertmer, 2005; Mishra & Koehler, 2006).

Furthermore, the lack of alignment between ICT use and perceived curriculum demands discourages teachers from experimenting with technology, reinforcing the view that ICT is supplementary rather than essential. Furthermore, teachers' concerns about time loss mirror findings by Voogt & McKenney (2017). Fear of student distraction supports Tondeur et al. (2017), who observed that teachers often associate ICT with reduced discipline.

5.2.3 External and Internal Factors Shaping Beliefs

The study found that both internal factors (e.g., self-efficacy, past learning experiences) and external factors (e.g., lack of training, inadequate infrastructure, exam pressures) shape and reinforce teachers' beliefs. Internal influences include teachers' lack of confidence in using ICT and their own experiences with traditional teaching methods. On the other hand, external factors include a lack of subject-specific ICT training, poor access to technical support, limited administrative encouragement, and an exam-focused curriculum.

These findings align with the work of Chigama & Goronga (2022) and Mangena & Sibanda (2024), who also noted that systemic and contextual barriers interact with individual teacher beliefs to influence technology use in schools.

Mhishi, Gwizangwe & Bhukuvhani (2022) concur that even when ICT tools are introduced in teacher education and school contexts, their meaningful use is constrained by factors like limited skills, poor infrastructure, and lack of systemic support, leading to underutilization in core pedagogical tasks rather than transformative integration

Literature supports these insights. Mpofu and Shumba (2022) argue that continuous professional development is essential for improving mathematics instruction in Zimbabwe, particularly where ICT integration is required. Chikodzi (2020) emphasizes that workshops empower teachers with practical strategies for ICT integration in teaching of Mathematics in Zimbabwean Secondary Schools.

5.2.4 Policy-Practice Disconnection

Although ICT policies exist at the national and school levels, the study revealed a gap between policy and practice. School leadership often lacks clear strategies, timelines, or resources to enforce or support ICT integration in daily teaching. This results in ICT use being confined to isolated lessons or administrative tasks rather than sustained instructional transformation.

This supports earlier findings by Manhivi & Zikhali (2020), who noted that policy implementation in Zimbabwean schools is frequently hindered by poor coordination, weak funding mechanisms, and lack of localized adaptation.

5.3 Conclusions

Based on the research findings, the following conclusions can be drawn:

1. Pedagogical beliefs are the most significant barrier to ICT integration in mathematics teaching and the most influential factor in determining ICT underutilization. Teachers' perceptions of what constitutes "good" teaching override access to ICT tools.

2. The presence of ICT infrastructure alone does not guarantee integration into instructional practice. Beliefs about content, pedagogy, and student behavior mediate the actual use of technology.

3. Teacher professional development is inadequately aligned with the needs of mathematics teachers. Most training is generic, reinforcing the belief that ICT is irrelevant to math-specific pedagogical goals.

4. Curriculum and examination systems reinforce traditional beliefs, creating disincentives for adopting student-centered or technology-driven approaches.

5. Policy implementation is fragmented and inconsistent, with little institutional accountability or support to shift pedagogical culture, thereby weakening school-level ICT culture.

5.4 Recommendations

5.4.1 For Policy Makers

a) Revise ICT policy implementation frameworks to include mechanisms that address pedagogical change, not just infrastructure provision.

b) Integrate ICT into the national curriculum assessment structure, signaling its importance in both learning and evaluation.

c) Provide ongoing funding for maintenance, support, and updating of ICT infrastructure in all secondary schools.

d) Develop monitoring tools to track ICT usage in schools.

5.4.2 For Teacher Education and Professional Development

a) Develop and deliver subject-specific ICT training modules for mathematics teachers, with a focus on pedagogy, not just technical skills. Modules must be aligned to TPACK principles.

b) Promote reflective practices in teacher education to encourage critical engagement with one's own beliefs about teaching and learning.

c) Organize peer-learning communities or ICT "champion" programs where early adopters can mentor others in integrating technology meaningfully.

5.4.3 For School Leaders

a) Establish and empower ICT integration committees with clear mandate in schools to support planning, monitoring, and feedback.

b) Provide incentives and recognition for teachers who innovate with ICT in instruction.

c)Ensure that ICT use is embedded into lesson planning, teaching schedules. Include ICT use in classroom observation, lesson observations and teacher appraisal.

5.4.4 For Further Research

a) Conduct longitudinal studies to track changes in teacher beliefs and practices over time following targeted interventions.

b) Institute learner-focused studies that explore student perceptions and experiences of ICT integration in mathematics learning.

c)Investigate comparative ICT usage across subjects to determine whether beliefs differ across disciplines and why.

d) Investigate Comparative ICT usage differences between rural and urban schools and if any, determine why.

5.5 Final Reflection

This study reinforces the idea that technology integration in education is as much a cultural and psychological challenge as it is a technical one. Meaningful ICT integration requires more than hardware While governments and schools continue to invest in digital tools, these investments will yield limited returns unless the belief systems of educators are engaged, challenged, and supported through thoughtful, contextualized professional development. As Ertmer (2005) emphasizes, without addressing second-order barriers, ICT resources will continue to be underutilized.

In the context of Zimbabwean secondary mathematics education, there must be a shift **beyond access** to a focus on transforming pedagogical mindsets, rethinking curricular priorities, and building a systemic culture of innovation in mathematics teaching and learning.

REFERENCES

Babbie, E. R. (2016). The practice of social research (14th ed.). Cengage Learning.

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. Qualitative Research in Psychology, 3(2), 77–101.

Brink,H (2021).Fundamentals of research Methodology for health Care Professionals.4th Edition,Juta,Cape Town

Chigama, T., & Goronga, P. (2022). Exploring teachers' perceptions towards ICT integration in teaching and learning: The case of selected primary schools in Harare, Zimbabwe. Journal of African Education, 3(1), a6.

Chikodzi, D. (2020). Enhancing mathematics pedagogy through teacher professional development in Zimbabwean secondary schools. Zimbabwe Journal of Educational Research, 32(1), 55–72.

Cohen, L, Manion, L, &Morrison, (2018). Research Methods in Education (8th ed). Routledge.

Creswell, J. W. (2013). Qualitative Inquiry and Research Design: Choosing Among Five Approaches (3rd ed.). Sage Publications.

Creswell, J. W. (2014). Research design: Qualitative, quantitative, and mixed methods approaches (4th ed.). Sage Publications.

Creswell, J. W., & Creswell, J. D. (2018). Research design: Qualitative, quantitative, and mixed methods approaches (5th ed.). Sage Publications.

Denzin, N. K. (2017). The research act: A theoretical introduction to sociological methods (4th ed.). Routledge.

Denzin, N. K., & Lincoln, Y. S. (2018). The Sage handbook of qualitative research (5th ed.). Sage Publications.

Ertmer, P. A. (2005). Teacher pedagogical beliefs: The final frontier in our quest for technology integration? Educational Technology Research and Development, 53(4), 25–39.

Ertmer, P. A. (2006). Addressing first- and second-order barriers to change: Strategies for technology integration. Educational Technology Research and Devel

Kafyulilo A, C., Fisser, P., &Voogt,J,(2015). Factors affecting teachers' continuation of technology use in teaching.Education and Information Technologies,20(2),279-295

Kilpatrick, J., Swafford, J., & Findell, B. (Eds.). (2001). Adding it up: Helping children learn mathematics. Washington, DC: National Academy Press.

Mangena, A., & Sibanda, L. (2024). Information and Communication Technology usage in school management: A case of selected Hwange District schools in Matabeleland North Province, Zimbabwe. European Journal of Contemporary Education and E Learning, 2(4).

Manhivi, J., & Zikhali, J. T. (2020). Impact of ICTs on children's educational opportunities: A case study of a rural secondary school in Masvingo, Zimbabwe. Journal of Educational Studies, 19(1).

Merriam, S. B., & Tisdell, E. J. (2016). Qualitative research: A guide to design and implementation (4th ed.). Jossey-Bass.

Mhishi, M., Gwizangwe, I., & Bhukuvhani, C. (2022). Towards a sustainable technology-enhanced supervision and assessment of teaching practice: A pilot case of an e-supervision model at a university in Zimbabwe. International Journal of Education and Development using Information and Communication Technology (IJEDICT), 18(2), 68–79.

Mishra, P & Koehler, J (2006). Technological Pedagogical Content Knowledge: A Framework for Teacher Knowledge. Teachers College Record,108(6),1017-1054.

Mpofu, J., & Shumba, A. (2012). Challenges faced by students with special educational needs in early childhood development centres in Zimbabwe as perceived by ECD trainers and parents. Anthropologist, 14(4), 327–338.

Muleya, S. (2018). Planning strategies used to solve social and economic challenges faced by orphans and vulnerable children in accessing education at Secondary level: A case for Beitbridge District in Matabeleland South in Zimbabwe. Harare: University of Zimbabwe.

Muvikana, S. (2018). Methods of using ICT tools in the teaching of mathematics at junior level in Makoni District primary schools. Gweru: Midlands State University.

Nxasana, S. E, Chen, J, DU, X, and Hassan, M, A (2023). Teachers' Pedagogical Beliefs in a Project Based Learning School in South Africa. Education Sciences.

Ofem, B, Ofem, I, Eze, C, Akpan, E. (2025). Teachers preparedness for the utilization of AI in classroom assessment: The contributory effects of attitude toward technology, technological readiness and pedagogical beliefs with perceived ease of use and perceived usefulness as mediators. Frontiers in Education,10, Articles 1568306.

Ottenbreit-Leftwich, J., Glazewski, K. D., Newby, T. J., & Ertmer, P. A. (2010). Teacher value beliefs associated with using technology: Addressing professional and student needs. **Computers & Education, 55**(3), 1321–1335.
Patton, M. Q. (2015). Qualitative research & evaluation methods (4th ed.). Sage Publications.

Shulman, L. S. (1987). Knowledge and teaching: Foundations of the new reform. Harvard Educational Review, 57(1), 1–22.

Tondeur, J., van Braak, J., Ertmer, P. A., & Ottenbreit-Leftwich, A. (2017). Understanding the relationship between teachers' pedagogical beliefs and technology use in education: A systematic review of qualitative evidence. Educational Technology Research and Development, 65(3), 555–575.

Voogt, J., & McKenney, S. (2017). TPACK in teacher education: Are we preparing teachers to use technology for early literacy? Technology, Pedagogy and Education, 26(1), 69–83.

Zindi, F., & Ruparanganda, F. (2011). Evaluation of barriers to the integration of ICT in teaching and learning of science and mathematics in Zimbabwe's secondary schools. Zimbabwe Journal of Educational Research, 23(3), 222–236.

APPENDICES

APPENDIX A Questionnaire for Teachers

BINDURA UNIVERSITY OF SCIENCE EDUCATION

FACULTY OF SCIENCE EDUCATION

DEPARTMENT OF MATHEMATICS AND SCIENCE

RESEARCH TOPIC: Beyond Access: Exploring Mathematics Teachers' Pedagogical Beliefs and The Underutilization of ICT Tools in Zimbabwean Secondary Schools.

NHANDO KILLION SEKAYI B240139A

Dear Participant

My name is Nhando Killion. I am a secondary school mathematics teacher. I'm studying for a Bachelor of Science Education Honours degree majoring in Mathematics at Bindura University of Science Education. I am carrying out a research to explore Pedagogical Beliefs and Underutilization of ICT tools in mathematics education at secondary Schools in Zimbabwe.

This questionnaire is part of a research study exploring mathematical teachers' pedagogical beliefs and the underutilization of ICT tools in Zimbabwean secondary schools. Your responses will provide valuable insights into the challenges and opportunities that currently exist in ICT integration in Mathematics education. Your input will also inform strategies for improvement.

Please answer the questions honestly and to the best of your ability. Feel free to elaborate on your responses where necessary. We value your opinions and experiences as a Mathematics teacher. Your participation is confidential and anonymous.

Instructions for Completing the Questionnaire

1.For confidentiality reasons, do not write your names on these sheets.

2.Use point form to answer questions when you wish to give more than one response.

3.Use the given spaces to answer the questions.

4.If you feel you cannot answer any question leave it blank.

5.Follow instructions that are given under some questions which are in *italics*.

6.All answers that you provide will only be used for the purposes of writing this thesis.

7.Only the researcher and the supervisor have access to the answers that you have provided.

Section A: Demographic Information

1. Gender: □ Male □ Female

2. Age: □ 20–29 □ 30–39 □ 40–49 □ 50+

3.Subject taught: _____

4.Level: □ ZJC □ O Level □ A Level

5. Teaching experience: □ 0–5 yrs □ 6–10 yrs □ 11–20 yrs □ 20+ yrs

6. School type: □ Urban □ Rural □ Private □ Government

7. Highest teaching qualification in Mathematics

□ Certificate □ Diploma □ BEd □ BSc □ Masters □ Phd

8.ICT qualification/training: □ None □ Basic □ Intermediate □ Advanced

Section B: Access to ICT Tools

9. Which ICT tools are available at your school?

□ Computers □ Projectors □ Smartboards □ Tablets □ Internet □ None

10. How often do use ICT devices (e.g., computers, tablets, smartphones)?

□ Daily □ Weekly □ Monthly □ Rarely □ Never

Section C: Pedagogical Beliefs

11. ICT enhances mathematical understanding.

□ Strongly Agree □ Agree □ Neutral □ Disagree □ Strongly Disagree

12. ICT increases student engagement in mathematics lessons.

□ Strongly Agree □ Agree □ Neutral □ Disagree □ Strongly Disagree

13. Traditional teaching is more effective than ICT-based teaching.

□ Strongly Agree □ Agree □ Neutral □ Disagree □ Strongly Disagree

14.*Give at least two reasons*

_____
_____
_____
_____

15. Do you find ICT tools helpful in understanding Mathematics concepts?

□ Yes □ No

*Please explain*_____
_____

Section D: ICT Utilization

16. Common ICT tools used in mathematics:

□ PowerPoint □ GeoGebra □ Online videos □ computers

□ smartboard □ projectors □ tablets □ chalkboard

□ Printed handouts □ internet □ None

17. ICT activities used:

□ Demonstrations □ Practice exercises □ Group projects □ Online assessments □ None

Section E: Barriers and Support

18. Barriers to ICT integration (tick all):

□ Lack of training □ Lack of infrastructure □ Poor internet □ Time constraints

□ Lack of support □ Large classes

*Elaborate*_____
_____
_____
_____
_____
_____

19. What kind of support would help you use ICT more effectively?

_____

_____
_____
_____
_____

Thank you

APPENDIX B Semi-Structured Interview Guide

BINDURA UNIVERSITY OF SCIENCE EDUCATION

FACULTY OF SCIENCE EDUCATION

DEPARTMENT OF MATHEMATICS AND SCIENCE

RESEARCH TOPIC: Beyond Access: Exploring Mathematics Teachers' Pedagogical Beliefs and The Underutilization of ICT Tools in Zimbabwean Secondary Schools.

NHANDO KILLION SEKAYI B240139A

Dear Mathematics teacher

My name is Nhando Killion. I am a secondary school mathematics teacher. I'm studying for a Bachelor of Science Education Honours degree majoring in Mathematics at Bindura University of Science Education. I am carrying out a research to explore Pedagogical Beliefs and Underutilization of ICT tools in mathematics education at secondary Schools in Zimbabwe.

Purpose: To explore teachers' beliefs, experiences, and contextual challenges influencing ICT use beyond survey data.

Please answer the questions honestly and to the best of your ability. Feel free to elaborate on your responses where necessary. We value your opinions and experiences as a Mathematics teacher. Your participation is confidential and anonymous.

A. Background

1. Could you state your teaching experience and exposure to ICT in mathematics education?

Teaching experience_____

ICT usage_____

2. How would you rate your competence and confidence in using ICTtools? Poor? Satisfactory? Good? Very good?

_____

B. Pedagogical Beliefs

3. Do you think ICT contributes to the effective learning of mathematical concepts?

_____

4. Which method of teaching Mathematics do you prefer between traditional methods and ICT-based method? Give reasons.

_____

C. ICT Use

5. Which teaching resource or ICT tools or platforms in your classroom do you find most useful for teaching mathematics?

_____

6. Do you use ICT in Mathematics instruction? Daily, Weekly, Monthly, Never?

_____

D. Barriers and Support

7. What challenges have you encountered in integrating ICT into your teaching?

_____
_____
_____

8. What forms of training or institutional support would make ICT use easier for you?

_____
_____
_____

E. Recommendations

9. How can schools or the Ministry of Education encourage more effective ICT integration?

_____
_____

10. What advice would you give to new teachers regarding ICT in mathematics?

Thank you very much.

APPENDIX C Questionnaire for school managers

BINDURA UNIVERSITY OF SCIENCE EDUCATION

FACULTY OF SCIENCE EDUCATION

DEPARTMENT OF MATHEMATICS AND SCIENCE

RESEARCH TOPIC: Beyond Access: Exploring Mathematics Teachers' Pedagogical Beliefs and The Underutilization of ICT Tools in Zimbabwean Secondary Schools.

NHANDO KILLION SEKAYI B240139A

Dear School Manager

My name is Nhando Killion. I am a secondary school mathematics teacher. I'm studying for a Bachelor of Science Education Honours degree majoring in Mathematics at Bindura University of Science Education. I am carrying out a research to explore Pedagogical Beliefs and Underutilization of ICT tools in mathematics education at secondary Schools in Zimbabwe.

This questionnaire is part of a research study exploring mathematical teachers' pedagogical beliefs and the underutilization of ICT tools in Zimbabwean secondary schools. Your responses will provide valuable insights into the challenges and opportunities that currently exist in ICT integration in Mathematics education. Your input will also inform strategies for improvement.

Please answer the questions honestly and to the best of your ability. Feel free to elaborate on your responses where necessary. Your participation is confidential and anonymous.

Instructions for Completing the Questionnaire

1.For confidentiality reasons, do not write your names on these sheets.

2.Use point form to answer questions when you wish to give more than one response.

3.Use the given spaces to answer the questions.

4.If you feel you cannot answer any question leave it blank.

5.Follow instructions that are given under some questions which are in *italics*.

6.All answers that you provide will only be used for the purposes of writing this thesis.

7.Only the researcher and the supervisor have access to the answers that you have provided.

Section A: Demographic Information

1. Gender: □ Male □ Female

2. Age: □ 20–29 □ 30–39 □ 40–49 □ 50+

3.Position: _____

4.Experience: □ 0–5 yrs □ 6–10 yrs □ 11–20 yrs □ 20+ yrs

6. School type: □ Urban □ Rural □ Private □ Government

7. ICT qualification/training: □ None □ Basic □ Intermediate □ Advanced

Section B: Access to ICT Tools

6. Which ICT tools are available at your school?

□ Computers □ Projectors □ Smartboards □ Tablets □ Internet □ None

7. Frequency of ICT use by Mathematics teachers:

□ Daily □ Weekly □ Monthly □ Rarely □ Never

Section C: Pedagogical Beliefs

8. ICT enhances mathematical understanding.

□ Strongly Agree □ Agree □ Neutral □ Disagree □ Strongly Disagree

9. ICT increases student engagement in mathematics lessons.

□ Strongly Agree □ Agree □ Neutral □ Disagree □ Strongly Disagree

10. Traditional teaching is more effective than ICT-based teaching.

□ Strongly Agree □ Agree □ Neutral □ Disagree □ Strongly Disagree

Section D: ICT Utilization

11. How often do you monitor use of ICT tools by teachers in Mathematics lessons?

□ Daily □ Weekly □ Monthly □ Rarely □ Never

12. Which ones of the following are the most common ICT tools used in mathematics?

□ PowerPoint □ Geo-Gebra □ Excel □ Online videos □ Simulations □ None

12. ICT activities used:

□ Demonstrations □ Practice exercises □ Group projects □ Online assessments □ None

Section E: Barriers and Support

13. Barriers to ICT integration (tick all):

□ Lack of training □ Lack of infrastructure □ Poor internet □ Time constraints

□ Large classes □ Financial constraints □ Teachers' reluctance

14. What kind of support do you think Mathematics teachers need for them to use ICT more effectively?

_____
_____
_____
_____
_____

Thank you

APPENDIX D Questionnaire for Learners

BINDURA UNIVERSITY OF SCIENCE EDUCATION

FACULTY OF SCIENCE EDUCATION

DEPARTMENT OF MATHEMATICS AND SCIENCE

RESEARCH TOPIC: Beyond Access: Exploring Mathematics Teachers' Pedagogical Beliefs and The Underutilization of ICT Tools in Zimbabwean Secondary Schools.

NHANDO KILLION SEKAYI B240139A

Dear Participant

My name is Nhando Killion. I am a secondary school mathematics teacher. I'm studying for a Bachelor of Science Education Honours degree majoring in Mathematics at Bindura University of Science Education. I am carrying out a research to explore Pedagogical Beliefs and Underutilization of ICT tools in mathematics education at secondary Schools in Zimbabwe.

This questionnaire is part of a research study exploring mathematical teachers' pedagogical beliefs and the underutilization of ICT tools in Zimbabwean secondary schools. Your responses will provide valuable insights into the challenges and opportunities that currently exist in ICT integration in Mathematics education. Your input will also inform strategies for improvement.

Please answer the questions honestly and to the best of your ability. Feel free to elaborate on your responses where necessary. We value your opinions and experiences as a Mathematics learner. Your participation is confidential and anonymous.

Instructions for Completing the Questionnaire

1.For confidentiality reasons, do not write your names on these sheets.

2.Use point form to answer questions when you wish to give more than one response.

3.Use the given spaces to answer the questions.

4.If you feel you cannot answer any question leave it blank.

5.Follow instructions that are given under some questions which are in *italics*.

6.All answers that you provide will only be used for the purposes of writing this thesis.

7.Only the researcher and the supervisor have access to the answers that you have provided.

Section A: Demographic Information

1. Gender: □ Male □ Female

2. Age: □ 10–15 □ 16–20 □ 20+

3.Level: □ ZJC □ O Level □ A Level

4. School type: □ Urban □ Rural □ Private □ Government

Section B: Access to ICT Tools

5. Which ICT devices are available at your school?

□ Computers □ Projectors □ Smartboards □ Tablets □ Internet □ None

6. How frequently does your teacher use ICT tools in teaching Mathematics?

□ Daily □ Weekly □ Monthly □ Rarely □ Never

Section C: Beliefs about effectiveness of ICT in teaching Mathematics

7. ICT improves my mathematical understanding.

□ Strongly Agree □ Agree □ Neutral □ Disagree □ Strongly Disagree

8. ICT increases learners' engagement in mathematics lessons.

□ Strongly Agree □ Agree □ Neutral □ Disagree □ Strongly Disagree

9.Do you think teachers should use ICT tools more often during teaching of mathematics?

□ Yes □ No

Give a brief reason

Section D: ICT Utilization

10. Common ICT tools used in mathematics lessons:

□ PowerPoint □ GeoGebra □ Excel □ Online videos □ Simulations □ None

11. ICT activities used:

□ Demonstrations □ Practice exercises □ Group projects □ Online assessments □ None

Thank you very much.